

SAFETY DATA SHEET

Date Printed: January 21, 2022

Version: 5

Regulation: According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

1. Identification

1.1 Product identifier

1.1.1 Product of name: EDC

1.1.2 Other means of identification: Ethylene dichloride

1.2 Recommended use of the chemical and restrictions on use

1.2.1 Recommended use: Raw materials and intermediates, catalysts, photochemical products, solvents and extractants, battery electrolytes, others (swelling agents)

1.2.2. Restrictions on use: Do not use for purposes other than those recommended.

1.3 Details of the supplier of the safety data sheet

1.3.1 Manufacturer

Company name: Hanwha Solutions Co, Ltd. Address:

- Yeosu plant, Hanwha Solutions Co, Ltd., 117 (Wolha-dong), Yeosusandan 3-ro, Yeosu-si, Jeollanam-do, Korea

- Ulsan plant 1, Hanwha Solutions Co, Ltd., 141 (Sanggae-dong), Sanggae-ro, Nam-gu, Ulsan, Korea Prepared by: VCM Production Team

Contact Telephone: (Yeosu plant) +82-61-688-1724

(Ulsan plant) +82-52-279-2323

1.3.2 Supplier & Distributor

Company name: Hanwha Solutions Co, Ltd.

Address: Hanwha Bldg., 86 (Janggyo-dong), Cheonggyecheon-ro, Jung-gu, Seoul, Korea Prepared by: CA Global Sales Team Contact Telephone: +82-10-3484-9108

1.4 Emergency phone number

Emergency phone: +82-10-3484-9108

2. Hazard(s) identification

2.1 Classification of the substance or mixture

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Physical / Chemical Hazards:

Flammable liquid: Category 2

Health Hazards:

Acute toxicity (oral): Category 4 Skin corrosion/irritation: Category 2 Serious eye damage/eye irritation: Category 2A Carcinogenicity: Category 2 Specific target organ toxicity (single exposure): Category 3 (respiratory tract irritation)

Environmental Hazards:

Hazardous to the aquatic environment, short-term (acute): Category 3

2.2 Label elements, including precautionary statements o Pictogram and symbol:





o Signal word: Danger

o Hazard statements:

- H225 Highly flammable liquid and vapour
- H302 Harmful if swallowed
- H315 Causes skin irritation
- H319 Causes serious eye irritation
- H335 May cause respiratory irritation
- H351 May Cause cancer
- H402 Harmful to aquatic life

o Precautionary statements:

- Prevention:

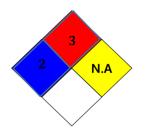
- P201 Obtain, special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat,/sparks/open flames/hot surfaces. No smoking.
- P233 Keep container tightly closed.
- P240 Ground/Bond container and receiving equipment
- P241 Use explosion-proof electrical/ventilating/lighting equipment.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or n a well-ventilated area.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.
- P281 Use personal protective equipment as required.

- Treatment:

- P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
- P302+P352 IF ON SKIN: Wash with plenty of soap and water.
- P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P308+P313 IF exposed or concerned: Get medical advice/attention.
- P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P312 Call a POISON CENTER or doctor/physician if you feel unwell.
- P321 Specific treatment
- P330 Rinse mouth.
- P332+P313 If skin irritation occurs: Get medical advice/attention.
- P337+P313 IF eye irritation persists: Get medical advice/attention.
- P362 Take off contaminated clothing and wash before reuse.
- P370+P378 In case of fire: Use suitable extinguishing media for extinction.
- Storage:
 - P403+P233 Store in a well-ventilated place. Keep container tightly closed.
 - P403+P235 Store in a well-ventilated place. Keep cool.
 - P405 Store locked up.
- Disposal:
 - P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazard information not included in hazard classification (National Fire Protection Association; NFPA)





o Health: 2 o Flammability: 3 o Reactivity: Not available

3. Composition/information on ingredients				
Component	Common name and synonyms	CAS No.	Conc. / %	
Ethylene dichloride	1,2-Dichlorethane	107-06-2	100	

4. First aid measures

4.1 Description of first aid measures

Eye contact

- Call 911 or emergency medical service.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If eye irritation persists: Get medical advice/attention.

Skin contact

- If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- If skin irritation occurs: Get medical advice/ attention.
- Remove and isolate contaminated clothing and shoes.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Wash skin with soap and water.
- Call emergency medical service.
- For minor skin contact, avoid spreading material on unaffected skin.

Inhalation

- If exposed or concerned: Get medical advice/ attention.
- Do not induce vomiting.
- If exposed to excessive levels of dusts or fumes, remove to fresh air and get medical attention if cough or other symptoms develop.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.

Ingestion

- If swallowed Get immediate medical advice/attention.
- Do not induce vomiting.
- Rinse mouth.
- If exposed or concerned: Get medical advice/ attention.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

4.2 Most important symptoms and effects, both acute and delayed effects

- Not known

4.3 Indication of immediate medical attention and notes for physician

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- Exposures require specialized first aid with contact and medical follow-up.
- Symptoms resulting from contact/inhalation may be delayed.

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. Fire-fighting measures

5.1 Extinguishing media

- Suitable extinguishing media: alcohol foam, carbon dioxide, or water spray
- Use dry sand or earth to smother fire.
- Unsuitable extinguishing media : straight streams
- Large Fire: water spray, alcohol foam
- Contain fire-fighting water in dike before disposal. (Prevention of material diffusion)
- Move containers from fire area if you can do it without risk.

5.2 Specific hazards arising from the chemical

- Highly flammable liquid and vapour
- May violently polymerize and result in fire and explosion
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Vapors may travel to a source of ignition and ignite.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas.
- May form explosive mixtures at temperatures at or above the flashpoint.
- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning. (Phosgene, carbon monoxide, hydrogen chloride etc.)
- May cause vapor explosion hazard indoors, outdoors or in sewers.

5.3 Special protective equipment and precautions for fire-fighters

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas.
- Substance may be transported hot.
- Substance may be transported in a molten form.
- Move containers from fire area if you can do it without risk.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks; Always stay away from tanks engulfed in fire.
- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- The very fine particles may cause a fire or explosion, eliminate all ignition sources.
- Clean up spills immediately, observing precautions in Protective Equipment section.
- Isolate hazard area.
- Keep unnecessary and unprotected personnel from entering.
- Do not touch or walk through spilled material.
- Eliminate all ignition sources.
- All equipment used when handling the product must be grounded.
- A vapor suppressing foam may be used to reduce vapors.



- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Stop leak if you can do it without risk.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Please note that there are materials and conditions to avoid.

6.2 Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

6.3 Methods and materials for containment and cleaning up

- Dike and collect water used to fight fire.
- Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Reduce airborne dust and prevent scattering by moistening with water.
- Absorb the liquid and scrub the area with detergent and water.
- Large Spill; Dike far ahead of liquid spill for later disposal.
- Use clean non-sparking tools to collect absorbed material.

7. Handling and storage

7.1 Precautions for safe handling

- Do not handle until all safety precautions have been read and understood.
- Use explosion-proof electrical/ventilating/lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Wash thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- Use only outdoors or in a well-ventilated area.
- Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition.
- Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
- Use carefully in handling/storage.
- Loosen closure cautiously before opening.
- Avoid prolonged or repeated contact with skin.
- All equipment used when handling the product must be grounded.
- Please note that there are materials and conditions to avoid.
- Be careful to heat.
- You need measurement of air concentration and ventilation in low, closed and confined areas due to lack of oxygen.

7.2 Conditions for safe storage, including any incompatibilities

- Keep away from heat/sparks/open flames/hot surfaces. No smoking
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.
- Keep away from food and drinking water.
- Store in a well-ventilated place. Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.

8. Exposure controls/personal protection

8.1 Occupational Exposure limits

- o ACGIH regulation: TWA 10 ppm
- o OSHA regulation: TWA 50 ppm (Final PELs), Ceiling 100 ppm (Final PELs),

TWA 1 ppm; 4 mg/m³ (Vacated PELs), STEL 2 ppm; 8 mg/m³ (Vacated PELs)

o NIOSH regulation: TWA 1 ppm; 4 mg/m³, STEL 2 ppm; 8 mg/m³, IDLH 50 ppm

- o Biological exposure index: Not available
- o EU regulation: TWA 2 ppm; 8.2 mg/m³



o Other:

- Korea : TWA 10 ppm
- Australia : TWA 10 ppm; 40 mg/m³
- Belgium : TWA 10 ppm; 41 mg/m³
- Demark : TWA 1 ppm; 4 mg/m³

8.2 Exposure controls

Appropriate engineering controls

- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- If user operations generate dust, fume, or mist, use ventilation to keep exposure to airborne contaminants below the recommended exposure limit.

Individual protection measures, such as personal protective equipment Respiratory protection

- Wear NIOSH approved full or half face piece (with goggles) respiratory protective equipment when necessary.

Eye protection

- Wear the protective glasses or breathable safety goggles to protect from vaporous state organic material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby work place.

Hand protection

- Wear chemical resistant gloves.

Body protection

- Wear appropriate protective chemical resistant clothing.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	
Description:	Viscous liquid
Color:	Colorless
Odor:	Sweet odor
Odor threshold:	Not available
pH:	Not available
Melting point/freezing point:	-35.5°C~-36°C
Initial boiling point and boiling range:	83.5°C~84.1°C
Flash point:	13°C
Evaporation rate:	Not available
Flammability (solid, gas):	Not applicable
Upper/lower flammability or explosive limits:	UEL 16%/LEL 6.2%
Vapor pressure:	81.3 hPa at 20°C
Vapor density:	Not available
Relative density	1.235 ~ 1.253(20°C)
Solubility:	8,490 – 9,000 mg/l at 20°C
Solubility in organic solvents:	Not available
Partition coefficient: n-octanol/water:	logKow=1.45
Auto ignition temperature:	413°C
Decomposition temperature:	Not available
Viscosity:	0.84 cP at 20°C
Molecular weight:	98.96 g/mol
Particle Size (Polymer compound)	Not applicable



Self-accelerated decomposition temperature (Polymer compound) Not applicable

"NOTE: The physical data presented above are typical values and should not be construed as a specification"

10. Stability and reactivity

10.1 Reactivity/Chemical stability/Possibility of hazardous reactions:

- Stable under normal temperatures and pressures.
- No polymerization reaction.
- May decompose at high temperatures into forming toxic gases.
- May form explosive mixtures at temperatures at or above the flashpoint.
- Containers may explode when heated.
- Highly flammable liquid and vapour
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Spilled material may create fire or explosion hazard.
- May cause vapor explosion hazard indoors, outdoors or in sewers.
- Vapors may form explosive mixtures with air.

10.2 Conditions to avoid:

- Keep away from heat/sparks/open flames/hot surfaces. No smoking
- Avoid contact with plastic.
- Containers may explode when heated.

10.3 Incompatible materials:

- Aluminum, ammonia, magnesium, metals, caustic, oxidizing agents, bases, amines, flammable substances

10.4 Hazardous decomposition products:

- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning. (Phosgene, carbon monoxide, hydrogen chloride etc.)

11. Toxicological information		
Information on toxicological effects		
(a) Acute toxicity		
Oral	Category 4	
	· LD ₅₀ (mouse, female/male) = 413-489 mg/kg bw (OECD TG 401)	
Dermal	Not classified	
	· LD ₅₀ (rabbit) = 4,890 mg/kg bw (OECD TG 402)	
Inhalation	Not classified	
	\cdot LC ₅₀ (rat, mist) = 5.35 mg/L air/4h. There were no deaths during the observation period and no significant toxic effects were observed. (OECD TG 403)	
(b) Skin Corrosion/ Irritation	Category 2	
	• As a result of skin corrosion/irritation test using rabbits, it showed irritation. (Primary Dermal Irritation Index (PDII) : 4.7) (Draize assay)	



(c) Serious Eye Damage/ Irritation	Category 2A
	• As a result of severe eye damage/irritation test using rabbits, it showed mild irritation. (Over irritation index: 7) (Draize assay)
(d) Respiratory sensitization	Not available
(e) Skin Sensitization	Not classified
	\cdot In human skin sensitization clinical trials, sensitization was not found.
	Category 2
(f) Carcinogenicity	 IARC : Group 2B (Possibly Carcinogenic to Humans) US EPA IRIS : B2 (Probable human carcinogen) NTP : R (Reasonably Anticipated To Be A Human Carcinogen) OSHA : applicable ACGIH : A4 (Not Classifiable as a Human Carcinogen) NIOSH : potential occupational carcinogen EU CLP 1272/2008: Carc. 1B As a result of carcinogenicity test using rats, tumor formation was significantly improved at high concentration (95 mg/kg bw/d) and low concentration (47 mg/kg bw/d). (OECD TG 451)
	Not classified
(g) Mutagenicity	 In vitro: Bacterial Reverse Mutation Assay : positive with/without metabolic activation (modified Ames test) In vitro: Mammalian Chromosome Aberration Test: positive (Cheromosomal aberration test) In vivo: Micronucleus test : negative (OECD TG 474, GLP) In vivo: Rodent Dominant Lethal Test : negative (Confirmation of dominant lethality through combined reproductive toxicity test)
	Not classified
(h) Reproductive toxicity	 In studies by oral and inhalation routes, no effects were observed on parental fertility, perinatal viability, and developmental disability of offspring. As a result of a teratogenicity test using rats at concentrations of 100 and 300 ppm, no signs of maternal toxicity, developmental or fetal toxicity or teratogenicity were observed at a concentration of 100 ppm. At 300 ppm, the evaluation of teratogenicity is not possible due to severe maternal toxicity and high mortality. NOAEL for teratogenicity was set at >100 ppm. (OECD TG 414) As a result of the two-generation reproductive toxicity test using mice, there were no pathological findings or evidence of extrinsic, exogenous, visceral or skeletal malformations according to the dose. (OECD TG 416)
(i) Specific target organ toxicity (single exposure)	Category 3 (Respiratory tract irritation)
	• Occupational dermal and inhalation exposure to humans may cause unspecified neurotoxic symptoms such as nausea, vomiting, headache, confusion, and dysequilibrium.
	Not classified
(j) Specific target organ toxicity (repeat exposure)	• As a result of a 90-day subchronic oral administration test at a concentration of 500, 1000, 2000, 4000, and 8000 ppm in drinking water using rats, no changes in macroscopic or histopathological organs related to the test substance were found (with more than 30 organs and tissue observation), but tubular abnormalities were observed in F344 (female) rats. The severity of the lesion was minimal and



	no animals died. NOAEL = ca. 320 mg/kg bw/day (Repeated Dose Toxicity (NTP/USA)
(k) Aspiration Hazard	Not available

12. Ecological information

12.1 Toxicity	
Acute toxicity	Category 3
	 Fish: 96h-LC₅₀ (<i>Oryzias latipes</i>) = 126 mg/L (semi-static, freshwater) (OECD TG 203, GLP) Invertebrate: 48h-EC₅₀ (<i>Daphnia magna</i>) = 99.4 mg/L (semi-static, freshwater) (OECD TG 202, GLP) Algae: 72h-ErC₅₀ (<i>Selenastrum capricomutum</i>) = 294 mg/L (closed type (shake culture), freshwater) (OECD TG 201, GLP)
	Not classified
Chronic toxicity	 Fish: 21d-NOEC (<i>Oryzias latipes</i>) = 41.3 mg/L (flow-though) (Preliminary Early Life Stage Test, GLP) Invertebrate: 28d-NOEC (<i>Daphnia magna</i>) = 11 mg/L (semi-static, freshwater) (ASTM Proposed Standard Practice (1979) semi-static) Algae: Not available
12.2 Persistence and degradability	 It is not biodegradable under non-acclimated test conditions, but can be rapidly biodegraded under appropriately acclimated or induced microbial conditions. However, under environmental conditions, it is unlikely to biodegrade. Half-life in water : 0.5-4 hour (laboratory test)
12.3 Bio- accumulative potential	· log P _{ow} = 1.45 · BCF = 2
12.4 Mobility in soil	$\cdot K_{oc} = 43$
12.5 Results of PBT and vPvB assessment	• The substance is not PBT / vPvB.
12.6 Hazardous to the ozone layer	Not classified
12.7 Other adverse effects	Not available

13. Disposal considerations

13.1 Disposal method

- Waste must be disposed of in accordance with federal, state and local environmental control regulations.

13.2 Disposal precaution

- Consider the required attentions in accordance with waste treatment management regulation.

14. Transport information

14.1 UN No.: 1184



14.2 UN Proper shipping name: ETHYLENE DICHLORIDE

14.3 Transport Hazard class:

- · ADR: 3 (6.1)
- IMDG: 3 (6.1)
- · ICAO/IATA: 3 (6.1)
- RID: 3 (6.1)

14.4 Packing group: II

14.5 Environmental hazards: Not applicable

14.6 Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not applicable

14.7 Special precautions for user in case of fire: F-E

in case of leakage: S-D

15. Regulatory information

15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture USA Regulatory Information

TSCA (Toxic Substances Control Act): Section8 (b) inventory: Present (T) (ACTIVE) Proposition 65: carcinogen, 10/1/1987 OSHA Regulation: Regulated CERCLA Regulation: 100 lb final RQ; 45.4 kg final RQ SARA 302 Regulation: Not regulated SARA 304 Regulation: Not regulated SARA 313 Regulation: 0.1 % de minimis concentration

Foreign Regulatory Information

Substance of Rotterdam] Protocol: Not regulated Substance of Stockholm Protocol: Not regulated Substance of Montreal Protocol: Not regulated

Foreign Inventory Status

- Korea management information: Existing Chemical Substance (KE-10121)

Phase-in substance subject of registration (119)

Toxic chemical (2001-1-518) (1,2-Dichloroetane and mixtures containing 0.1% or more thereof)

- European Inventory of Existing Commercial chemical Substances (EINECS): Present (203-458-1)

- Canada management information: Domestic Substances List (DSL): Present
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (09963)
- Japan management information: Existing and New Chemical Substances (ENCS): Present ((2)-54)
- Australia management information: Inventory of Chemical Substances (AICS): Present
- New Zealand management information: Inventory of Chemicals (NZIoC): Present (HSNO Approval: HSR001152)

- Philippines management information: Inventory of Chemicals and Chemical Substances (PICCS): Present

- Taiwan management information: Taiwan Chemical Substance Inventory (TCSI): Present

16. OTHER INFORMATION

16.1 Indication of changes:

Preparation date: January 7, 2020



Version: 5 Revision date: January 21, 2022

16.2 Key literature reference and sources for data:

- $\label{eq:search} {\rm o}\ {\rm TSCA}; {\rm http://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do}$
- EU Regulation 1272/2008
- o TOMES;LOLI ; http://csi.micromedex.com/fraMain.asp?Mnu=0
- \circ UN Recommendations on the transport of dangerous goods 17^{th}
- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; http://monographs.iarc.fr
- ECHA CHEM; http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances
- OECD SIDS; http://webnet.oecd.org/
- HSDB; https://pubchem.ncbi.nlm.nih.gov/
- EPA; http://www.epa.gov/iris
- EPISUITE Program ver.4.1
- NIOSH(The National Institute for Occupational Safety and Health)
- ACGIH(American Conference of Governmental Industrial Hygienists)
- National chemicals information systems; http://ncis.nier.go.kr
- National Emergency Management Agency-Korea dangerous material inventory management system; http://hazmat.mpss.kfi.or.kr/material.do
- K-REACH; K-REACH/registration-dossier

16.3 Abbreviations

ACGIH: American Conference of Governmental Industrial hygienists

NIOSH: The National Institute for Occupational Safety and Health

OSHA: Occupational Safety & Health Administration

IARC: International Agency for Research on Cancer

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

IMDG: International Maritime Dangerous Goods

ICAO/IATA: International Civil Aviation Organization/ International Air Transport Association

RID: Regulations Concerning the International Transport of Dangerous Goods by Rail

16.4 Other

- Product should be handled, stored, and used in accordance with the generally accepted industrial hygiene practices and in conformity with all the applicable legal regulations.
- The information provided herein is based on the knowledge possessed at this present time from the view point of safety requirements.
- It should, therefore, not be construed as guaranteeing specific properties.